BEFORE THE PUBLIC UTILITIES COMMISSION

OF THE STATE OF HAWAII

In the Matter of the Application of	)	
	)	
HAWAIIAN ELECTRIC COMPANY, INC.	)	Docket No.
	)	
for approval to commit funds in	)	
excess of $500,000 for Item Y48500,	)	
East Oahu Transmission Project.	)	
	)	

APPLICATION

EXHIBITS 1 - 11

VERIFICATION

and

CERTIFICATE OF SERVICE

William A. Bonnet
Vice President, Government
and Community Affairs
Hawaiian Electric Company, Inc.
P. O. Box 2750
Honolulu, Hawaii 96840

Telephone: 543-5660

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APPLICATION

TO THE HONORABLE PUBLIC UTILITIES COMMISSION
OF THE STATE OF HAWAII:

HAWAIIAN ELECTRIC COMPANY, INC., ("HECO") requests Commission approval to commit funds in excess of $500,000 (currently estimated at $55,424,000) for Item Y48500, East Oahu Transmission Project, in accordance with the provisions of Paragraph 2.3(g)(2) of General Order No. 7. HECO proposes to implement the project in two independent phases. The first phase, "Phase 1" includes: (1) the installation of six underground 46kV lines in the Ala Moana, McCully, Moiliili, and Kapahulu areas, (2) a 138kV/46kV transformer installation at the existing Kamoku Substation with associated protective relaying, and (3) modifications of various existing distribution substations in the Honolulu area. The second phase, "Phase 2" includes: (1) the installation of three underground 46kV lines in the Kakaako, Makiki, and McCully areas, and (2) a 138/46kV transformer installation at the existing Archer Substation with associated protective relaying. The location of the project is at various sites in the Honolulu area, as shown on Exhibit 1. The proposed East Oahu Transmission Project is described in detail in Part V of this Application, the objectives of the project are discussed in Part

VI, and the schedule for the project is included in Part X.

HECO proposes to place the 46kV lines underground that are being installed as part of this project. Pursuant to Section 269-27.6 (a) of the Hawaii Revised Statutes ("HRS"), HECO requests that the Commission determine that the 46 kV lines shall be built "below the surface of the ground . . . ." (See Part XIII of this Application.)

In addition, HECO requests that the Commission be the accepting agency for an environmental assessment ("EA") of the project to be voluntarily prepared by HECO and submitted to the Commission in accordance with the HRS Chapter 343 process. (See Part XV of this Application.)

I

HECO, whose principal place of business and whose executive offices are located at 900 Richards Street, Honolulu, Hawaii, is a corporation duly organized under the laws of the Kingdom of Hawaii on or about October 13, 1891, and is now existing under and by virtue of the laws of the State of Hawaii. HECO is an operating public utility engaged in the production, purchase, transmission, distribution and sale of electricity on the island of Oahu.

II

Correspondence and communications in regard to this Application should be addressed to:

William A. Bonnet
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P.O. Box 2750
Honolulu, Hawaii 96840-0001

with copies of such correspondence and communications sent to:

Patsy H. Nanbu
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and

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Alii Place, Suite 1800
1099 Alakea Street
Honolulu, Hawaii 96813

III

Exhibits

The following exhibits are provided in support of this Application:

Exhibit 1 - Project Location Map

Exhibit 2 - Cost Estimate Summary

Exhibit 3 - Project Schedule

Exhibit 4 - *Kamoku-Pukele 138-kV Transmission Line Project, Revised Final Environmental Impact Statement ("EIS")*, Volumes 1A and 1B, September 2000, and Volumes 2 and 3, September 1999

Exhibit 5 - *East Oahu Transmission Project Alternatives Study Update* (December 2003)

Exhibit 6 - *East Oahu Transmission Project: Options to the Koolau/Pukele Transmission Line Overload Problem* (December 2003)

Exhibit 7 - *Evaluation of the Applicability and Practicability of Live Working (LW) Methods for Hawaiian Electric Company, Inc.'s (HECO) 138 kV Transmission System* (December 2003)

Exhibit 8 - *Magnetic Field Measurement and Modeling Assessment for Proposed HECO 46 kV Underground Cables*, (September 29, 2003)

Exhibit 9 - *East Oahu Transmission Project Public Meetings*, June – July 2003 (Booklet)

Exhibit 10 - *East Oahu Transmission Project Public Meetings*, June – July 2003 (PowerPoint Presentation)

Exhibit 11 - *East Oahu Transmission Project, A Report on Public Input Collected in June and July 2003* (September 2003)

Since Exhibits 4 through 11 are voluminous, HECO will submit these exhibits under a separate transmittal. Exhibit 4 also includes volumes 4 through 26 of the Revised Final EIS, which primarily contain public participation materials, comment letters and responses. Volumes 4 through 26 are not being submitted and are available for viewing at HECO's Regulatory Affairs Office.[1]

IV

Written Testimonies

The following written testimonies (with related exhibits) are provided in support of this Application:

Witness Number	Witness	Subject
T-1	Thomas L. Joaquin	Project Need and Selection Process
T-2	Kerstan J. Wong	Description of Project and Background

[1] Please contact George Hirose in HECO's Regulatory Affairs Division at 543-4787 to make arrangements to review volumes 4 through 26 of the Revised Final EIS.

T-3	Randy Pollock	Transmission System Planning Process Overview, Development and Application of Transmission System Planning Criteria, Review of HECO Transmission Planning Criteria
T-4	Shari Y. Ishikawa	Planning/Project Need
T-5	Andrew H. Stewart	Live Working
T-6	Kerstan J. Wong	Description of Alternatives and Schedule
T-7	Ken T. Morikami	Routing
T-8	Thomas L. Harrington	Construction Schedule
T-9	Earlynne F. Oshiro	Project Cost
T-10	J. Michael Silva	Engineering Evaluation of Electric and Magnetic Fields ("EMF")
T-11	William A. Bonnet	EMF Policy
T-12	Robert A. Alm	Public Sentiment

V

Project Description

HECO proposes to implement the project in two independent phases, Phase 1 and Phase 2. Phase 1 includes: (1) the installation of six underground 46kV lines in the Ala Moana, McCully, Moiliili, and Kapahulu areas, (2) a 138kV/46kV transformer installation at the existing Kamoku Substation with associated protective relaying, and (3) modifications of various existing distribution substations in the Honolulu area. Phase 2 includes: (1) the installation of three underground 46kV lines in the Kakaako, Makiki, and McCully areas, and (2) a 138kV/46kV transformer installation at the existing Archer Substation with associated protective relaying.

Phase 1, 46kV Underground Lines

This item involves the installation of six new underground 46kV circuits to reconfigure and connect existing 46kV circuits from Pukele Substation, located at the end of HECO's Northern 138kV transmission corridor, with existing and new 46kV circuits from Archer Substation and Kamoku Substation, which are part of HECO's Southern 138kV transmission corridor, as follows:

1) Two circuits in a single duct line are required to connect the existing Archer 46 and Archer 41 underground 46kV circuits at Makaloa Substation with the existing Pukele 2 overhead 46kV circuit near the McCully Substation. The route of the duct line begins at Makaloa Substation on Makaloa Street near Ala Moana, continues in the Diamond Head direction through Kalakaua Avenue, Fern Street, Hauoli Street, Lime Street then terminates at McCully Substation on the corner of Lime Street and Pumehana Street in McCully. There is an alterative alignment to the proposed route that uses Kapiolani Boulevard. The alternative alignment was not selected as the proposed route alignment because, when compared to the proposed route alignment, the alternative alignment that utilizes Kapiolani Boulevard has a number of disadvantages. However, given the concerns regarding utilizing portions of the proposed route, HECO will continue to examine the alternative route despite its disadvantages. (See Mr. Morikami's testimony, HECO T-7.) Overhead reconnections of existing overhead 46kV circuits in and around McCully Substation are also required. This item includes the installation of approximately 7,250 circuit feet of 1500 KCM Polyethylene Insulated Jacketed (PEIJ) 3-1/C conductor 46kV cable, three sets of three-phase 46kV terminators, twenty sets of three-phase 46kV splices, 3,450 circuit feet of 8-5" underground ducts encased with concrete, 250 circuit feet of 4-5" underground ducts encased in concrete, ten 6' x 14' manholes, 110 circuit

feet of three-phase 556.5 KCM AAC 46kV overhead conductors, the removal of 160 circuit feet of three-phase 556.5 KCM AAC 46kV overhead conductors, and two 65-foot wood poles to replace two existing wood poles (55 to 65-foot) in the same locations.

2) One circuit is required to connect the existing Archer 41 overhead 46kV circuit on Pumehana Street with the existing Pukele 2 overhead 46kV circuit at the intersection of Date Street and Pumehana Street in McCully. An underground duct line would be constructed from one of the existing wood poles on Pumehana Street that carries the existing Archer 41 overhead 46kV circuit to an existing wood pole on Date Street carrying the existing Pukele 2 overhead 46kV circuit. This item includes the installation of approximately 130 circuit feet of 1500 KCM PEIJ 3-1/C conductor 46kV cable, two sets of three-phase 46kV terminators, one set of three-phase 46kV splices, 130 feet of 4-5"underground ducts encased with concrete, one 6' x 14' manhole, and two 65-foot wood poles to replace two existing wood poles (55 to 65-foot) in the same locations.

3) Two circuits are required in separate duct lines to connect the new 138-46kV, 80MVA transformer at Kamoku Substation to the existing Pukele 4 overhead 46kV circuit on Date Street fronting Kamoku Substation in Moiliili. Existing duct lines in Kamoku Substation would be utilized to route the circuits out of the enclosed substation. Once outside of the enclosed substation, new duct lines would be constructed to existing wood poles carrying the Pukele 4 overhead 46kV circuit on Date Street fronting the Kamoku Substation. This item includes the installation of approximately 660 circuit feet of 1500 KCM PEIJ 3-1/C conductor 46kV cable, four sets of three-phase 46kV terminators, three sets of three-phase 46kV splices, 50 feet of 8-5"underground ducts encased with concrete, 330 feet of 4-5" underground ducts encased with concrete, two 6' x14' manholes, one 46kV overhead group operated switch, and

two 65-foot wood poles to replace two existing wood poles (55 to 65-foot) in the same locations.

4) One circuit to connect the existing Pukele 4 overhead 46kV circuit on Mooheau Avenue with the existing Pukele 8 overhead 46kV circuit near the intersection of Mooheau Avenue and Winam Avenue in Kapahulu. An underground duct line would be constructed from one of the existing wood poles on Mooheau Avenue that carries the existing Pukele 4 overhead 46kV circuit to an existing wood pole on Winam Avenue carrying the existing Pukele 8 overhead 46kV circuit. This item includes the installation of approximately 420 circuit feet of 3-1/C conductor, 1500 KCM PEIJ 46kV cable, two sets of three-phase 46kV terminators, two sets of three-phase 46kV splices, 420 feet of 4-5" underground ducts encased with concrete, two 6' x14' manholes, and two 65-foot wood poles to replace two existing wood poles (55 to 65-foot) in the same locations.

Phase 1, Kamoku Substation

This item involves the installation of a new 138-46 kV, 80 MVA transformer with associated protective relaying at the existing Kamoku Substation located on Date Street in Moiliili. This item includes the installation of one 138-46 kV, 80 MVA, standard sound level transformer with forced oil and water cooling equipment; 130 feet of 138 kV GIS bus; three 138 kV GIS to transformer terminations; one 138 kV GIS breaker; seven protective relay panels; one 46 kV GIS switchgear line-up consisting of four 46 kV GIS breakers and associated equipment and approximately 8,000 feet of control cable. Site development work includes one 24' X 39' transformer pad, 126 linear feet of 22-foot high transformer vault walls, one 18.5' X 21' switchgear pad and 250 feet of 5" ducts.

Phase 1, Distribution Substation Modifications

This item involves modifications at the following existing distribution substations:

1) McCully Substation - This item involves the replacement of three existing 46kV switches (4684, 4909, 4794) with new switches rated at 46kV, 800 amperes, the replacement of existing 4/0 bus sections between switches 4794 and 4752 with 750 MCM aluminum conductors to achieve a continuous bus rating of 800 amperes, and the installation of a termination structure complete with 46kV terminators and lightning arrestors under switch 4909.

2) Makaloa Substation - This item involves the replacement of existing 4/0 bus sections between switches 4498 and 5405 and switches 4928 and 6089 with 750 MCM Aluminum conductors to achieve a continuous bus rating of 800 amperes, and installing three new three-phase 46kV group operated switches with associated steel work.

3) Kewalo Substation - This item involves the installation of 750 MCM Aluminum conductors between switches 4919 and 5311 to achieve a continuous bus rating of 800 amperes.

4) Kuhio Substation – This item involves the replacement of three existing hydraulic operators with new motor operators including all associated control duct installations, battery banks, cabinets, and wiring and the installation of one 46kV switch interrupter.

5) Waikiki Substation – This item involves the replacement of six existing hydraulic operators with new motor operators including all associated control duct installations, battery banks, cabinets, and wiring and the installation of two 46kV switch interrupters.

6) Ena Substation – This item involves the replacement of seven existing hydraulic operators with new motor operators including all associated control duct installations, battery banks, cabinets, and wiring and the installation of three 46kV switch interrupters.

7) Kapahulu Substation – This item involves the replacement of nine existing

hydraulic operators with new motor operators including all associated control duct installations, battery banks, cabinets, and wiring and three 46kV switch interrupters.

Phase 2, 46kV Underground Lines

This item involves the installation of three new underground 46kV circuits (Archer 45, Archer 47, and Archer 48) to connect a new 138-46kV, 80MVA transformer at Archer Substation to three existing 46kV circuits (Pukele 7, Pukele 6 and Pukele 5) terminating at the Pukele Substation.

1) New cable trays in Archer Substation would be installed to route the circuits out of the enclosed substation located on HECO's Ward Avenue facility near the corner of Cooke Street and King Street in Kakaako.

2) Once outside of the enclosed substation, a new duct line carrying the three new underground 46kV circuits (Archer 45, Archer 47, and Archer 48) would be constructed and routed through HECO's property onto Cooke Street. On Cooke Street, the duct line proceeds mauka until King Street then proceeds in the Diamond Head direction on King Street until Hauoli Street.

3) Near the King Street and Hauoli Street intersection, the Archer 48 underground 46kV circuit branches off into a separate duct line that terminates at an existing wood pole located on King Street fronting the McCully Times Supermarket parking lot. The existing wood pole carries the existing Pukele 5 overhead 46kV circuit, which will be connected to the new Archer 48 circuit at this point.

4) Also near the King Street and Hauoli Street intersection, the Archer 47 underground 46kV circuit branches off into a separate duct line that terminates at an existing wood pole located on King Street fronting American Savings Bank. The existing wood pole

carries the existing Pukele 5 overhead 46kV circuit, which will be connected to the new Archer 47 circuit at this point.

5) The Archer 45 underground 46kV circuit continues in the Diamond Head direction on King Street in a separate duct line until McCully Street then proceeds in the mauka direction until Young Street. At Young Street, the duct line will terminate at an existing wood pole carrying the existing Pukele 7 overhead 46kV circuit, which will be connected to the new Archer 45 circuit at this point.

This item includes the installation of approximately 26,750 circuit feet of 1500 KCM PEIJ 3-1/C conductor 46kV cable, six sets of three phase 46kV terminators, 54 sets of three-phase 46kV splices, 8,325 feet of 12-5" underground ducts encased in concrete, 1,540 feet of 4-5" underground ducts encased in concrete, twenty 6' x 14' manholes, 900 feet of steel cable tray, and three 65-foot wood poles to replace three existing wood poles (55 to 65-foot) in the same locations.

Phase 2, Archer Substation

This item involves the installation of a new 138-46 kV, 80 MVA transformer with associated protective relaying at the existing Archer Substation located on HECO's Ward Avenue facility near the corner of Cooke Street and King Street in Kakaako. This item includes the installation of one 138-46 kV, 80 MVA, standard sound level transformer; redundant air handling equipment; 35 feet of 138 kV GIS bus; one 138 kV GIS breaker; two new protective relay panels; modifications to one existing protective relay panel; three 138 kV GIS to air terminations; three 138 kV insulators, modifications to the existing remote terminal unit; 150 feet of 556 kcmil AAC conductor; 1,750 feet of 1500 kcmil aluminum cable; six 46 kV terminators; 676 feet of cable trays and approximately 6,500 feet of control cable. Site development work

includes knocking out a CMU wall at Archer Substation to install the transformer and then replacing the wall, one 12' X 18' transformer pad, 485 cubic yards of rock fill, 35 feet of 6-5" ducts and 50 feet of 3-3" ducts.

VI

Project Objectives

Background

Bulk power from Leeward Oahu power plants is transmitted to the East Oahu Service Area over two major transmission corridors. The Northern Transmission Corridor extends from Kahe Power Plant to the Halawa Substation, Koolau Substation and the Pukele Substation, where it currently ends. With the completion of the two Waiau-CIP 138kV Transmission lines in 1995, the Southern Transmission Corridor was extended from the Kahe Power Plant to the Waiau Power Plant and Iwilei, School Street, and Archer Substations. The Southern Transmission Corridor was recently extended to the Kamoku Substation through the installation of two 138kV transmission lines from Archer Substation to Kewalo Substation and the installation of a 138kV transmission line from Kewalo Substation to Kamoku Substation.

In West Oahu, the two corridors are linked together by transmission lines between power plants and substations connected to the Northern and Southern Corridors. However, no similar connection exists to provide reliable power to the East Oahu Service Area. HECO's plan has been to build upon existing facilities installed to serve the local load growth through the Archer-Kewalo-Kamoku projects and close the existing gap between the Northern Transmission Corridor and the Southern Transmission Corridor on the East Side of Oahu, providing added reliability to the Eastern and Windward portions of Oahu, which represents 56% of HECO's total load.

The purpose of the East Oahu Transmission Project is to address several transmission problems concerning Oahu's 138kV transmission system in the eastern half of the island. (See Mr. Pollock's testimony, HECO T-3, and Ms. Ishikawa's testimony, HECO T-4.) First, an overload situation with one of the three 138kV transmission lines that transport power to the Koolau/Pukele Service Area[2] in the Northern 138kV transmission corridor could occur beginning in 2005, whenever the other two lines are out of service ("Koolau/Pukele Overload Situation"). Second, an overload situation with one of the three 138kV transmission lines that transport power to the Downtown Area[3] in the Southern 138kV transmission corridor could occur beginning in 2023, whenever the other two lines are out of service ("Downtown Overload Situation"). Third, Pukele Substation, located at the end of the Northern 138kV transmission corridor, would be without power if the two 138kV transmission lines serving it were to be lost. Pukele Substation serves critical loads such as Waikiki, State Civil Defense, Hawaii Air and Army National Guard Headquarters, and the University of Hawaii ("Pukele Substation Reliability Concern"). And fourth, Archer Substation, Kewalo Substation and Kamoku Substation, all located in the Southern 138kV transmission corridor, would be without power if the two 138kV transmission lines serving Archer Substation were to be lost ("Downtown Substation Reliability Concern"). Kewalo Substation receives power from Archer Substation via two 138kV transmission lines, and Kamoku Substation receives power via one 138kV transmission line from Kewalo Substation. These substations serve critical loads such as the

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[2] The Koolau/Pukele Service Area is the combined area served by Koolau Substation and Pukele Substation.

[3] The Downtown Area is the combined area served by the School Street, Iwilei, Archer, Kewalo and Kamoku Substations.

Honolulu Police Department Headquarters and the Hawaii Convention Center.

Pukele Substation Reliability Concern

Two 138kV transmission lines currently feed the Pukele Substation from the Koolau Substation in Kaneohe, on the windward side of Oahu. The two 138kV lines cross the Koolau Mountain Range to connect the Pukele Substation to the rest of the HECO system. The power transported from these two lines is stepped down to the sub-transmission voltage and transported over eight 46kV feeders that branch out from Palolo Valley to distribution substations in Kahala, Kaimuki, Manoa, Makiki and Waikiki.

The Pukele Substation is the most heavily loaded 138kV substation in the HECO system. Based on 2002 Day Peak load conditions, the Pukele Substation supplies electricity to about 16% of the Oahu load (or approximately 192 MW of the daytime peak load).

If the two lines providing power to the Pukele substation are both out of service, 93% of the customers serviced from the Pukele Substation will incur an outage. Most of HECO's customers in the area extending from Makiki to Waikiki, and from Koolau to Kaimuki, would be out of power until one of the two 138kV transmission lines could be restored to service. While many parts of the two lines have been renewed and upgraded, the two Koolau-Pukele 138kV transmission lines are substantially 40 years old. Typically, a transmission line experiences an increase in forced outages as the line ages. Even with visual inspections and maintenance on the Koolau-Pukele 138kV transmission lines, forced outages will occur. These lines are subject to extreme weather conditions due to the high winds, heavy rains, and salt laden marine air that are prevalent in the coastal Koolau Mountain Range.

Hawaii has been fortunate that the second of the two 138kV lines to Pukele Substation has not tripped out of service while the other line was out for maintenance, or out of

service due to a forced outage. The latter situation very nearly occurred in 1994. In addition, HECO has experienced simultaneous forced outages on multiple lines on other parts of the HECO system—outages that seemed even less likely to occur and the impact of these events caused a large loss of service to the HECO customers. In the case of two major system outages, two lines tripped out at about the same time while another line was out of service for maintenance.

The Waikiki area includes large hotels and commercial shopping areas, and a power interruption to these loads would have a major impact on the local and state economies. A blackout of Waikiki would be reported around the world creating a "third world" image for Hawaii's main resort area at a time when Hawaii is positioning itself as a safe, secure domestic destination for relaxation and rejuvenation. In addition, many facilities essential to Hawaii's safety and security, such as the State Civil Defense, are also in this service area, as well as the University of Hawaii at Manoa and Kapiolani Community College. A blackout at the University of Hawaii could impact research and experiments involving millions of dollars. A blackout that incapacitates the Hawaii National Guard and Civil Defense facilities at Diamond Head could have a serious effect on Hawaii's safety and security.

Some customers with emergency generators on site may be able to meet limited power needs during an area blackout. However, typical emergency generators (at a hotel, for example) serve only critical loads such as elevators and emergency lighting. Ultimately the vast majority of customers within the Pukele service area, including most of Waikiki, would be without power until at least one of the two 138kV lines to the Pukele Substation was restored to service.

The duration of a forced outage of the Koolau-Pukele line will depend on the

severity of the damage to the line. The duration could be instantaneous or within a minute as seen with the 1994 flashover incidents on the Koolau-Pukele lines, or could last days as in the case of the April 5, 2003 outage on the Koolau-Pukele #1 line. The Koolau-Pukele #1 138kV transmission line experienced a continuous outage (including the Evening Peak period) for 4½ days due to structure damage. Severe weather conditions could also cause a prolonged outage that could take weeks to repair.

In the case of a prolonged interruption of power to the Pukele Substation, most of the customers served by the substation would continue to experience an outage for the duration of the power interruption. The load in certain segments of the Pukele service area could be manually switched to other 46kV back up circuits receiving power from the Koolau Substation. Presently, about 20% of the total electricity demand of the Pukele Service Area could be restored to service after manual switching operations on the existing 46kV system were implemented. These customers would experience a 2 to 4 hour outage until all the switching could be done to transfer them to these back up circuits.

Koolau/Pukele Line Overload

There are three 138kV transmission lines providing power to the Koolau Substation. There are two 138kV transmission lines from the Koolau Substation that provide power to the Pukele Substation. Together these two substations provide power to 30% of the load served by HECO on Oahu. Based on load flow analyses using the load projections in HECO's August 2002 load forecast, with one 138kV transmission line to the Koolau Substation out of service for maintenance, if a second 138kV Koolau transmission line becomes unavailable for any reason, the current flowing through the third 138kV Koolau transmission line is projected to exceed its emergency current carrying capacity rating during daytime peak load conditions in

the year 2005. It appears, however, that the situation could occur in 2004, since peak loads have increased at a faster rate than forecast.

This would violate HECO's Transmission Planning Criteria, which provides that no transmission component shall exceed its emergency rating with one generating unit on overhaul, one transmission line out for maintenance and loss of a second transmission line. If the current flowing through the remaining 138kV transmission line exceeds the emergency rating of the line, the conductor will heat up beyond normal operating parameters and could possibly break down and the line could suddenly be lost. Loss of the third 138kV transmission line feeding the Koolau/Pukele area would result in loss of electricity service to 30% of HECO's customers, including sub-transmission substations that feed communities such as Kailua, Kaneohe, Kahala, McCully and Waikiki. The damage caused to the failed transmission line from the overload could lead to a continuous prolonged outage of the line in order to perform the repairs, placing HECO at risk of an additional overload situation.

In the event of a possible overload situation, an Energy Management System ("EMS") program will automatically shed load at the Koolau and Pukele Substations in pre-selected blocks in a pre-selected order associated with the most overloaded transmission line. The program is activated by an overcurrent protection scheme, which will shed load if the current flowing through the Koolau 138kV lines goes above 1640 amps, the emergency rating of the Koolau 138kV transmission lines. Once load is shed, currents are rechecked to see if they have returned to normal, and if the current is still above 1640 amps, additional circuits will be shed. The amount of load that HECO would have to shed during a line overload situation would vary, since the load in the Koolau/Pukele area varies throughout the day.

The emergency rating of the conductor is an engineering value based on conductor

size, material, and design wind conditions, but does not account for other factors in the field such as: actual weather conditions, the number of conductor splices, the age and condition of conductors, the accuracy of current transformers in the overcurrent protection scheme, and the terrain where the line is installed. Therefore, the Supervising Load Dispatcher or any higher-ranking System Operation personnel may, at their discretion, take precautionary measures and intervene before the overcurrent protection scheme is activated, to avoid larger outages or maintain system integrity. The system operator has the ability to shed individual 12kV and 46kV distribution feeders in the Koolau/Pukele area to decrease the current flow until there is no longer an overload situation.

Downtown Line Overload

There are two 138kV transmission substations serving the Downtown area, including the Iwilei Substation and the School Substation. Power to serve the Downtown area can also come from the Honolulu Power Plant ("HPP"), when it is on line. Together, these two substations and the HPP (when on-line) provide power to 26% of the load served by HECO. These two transmission substations are fed from three 138kV transmission lines providing power from the Halawa Substation via the Halawa-Iwilei 138kV transmission line and the Halawa-School 138kV transmission line, and from Makalapa Substation via the Makalapa-Airport-Iwilei 138kV transmission line. If one of the three 138kV transmission lines to Iwilei or School Substation is taken out of service for maintenance, and a second Downtown 138kV transmission line becomes unavailable, then the current flowing through the remaining Downtown 138kV transmission line is forecast to exceed the emergency current carrying capacity rating during daytime peak load conditions in the year 2023, assuming the HPP is on line. Again, this would result in a violation of HECO's Transmission Planning Criteria, because the current flowing

through the third 138kV transmission line feeding the Downtown Substations would exceed the emergency rating of the line.

The availability of the HPP defers the overload problem. When the HPP is operating, power from the plant feeds the neighboring areas and decreases the demand for power from the West Side, which decreases the current flowing through the three 138kV transmission lines feeding School Street and Iwilei Substations. If the HPP was not operating, the Downtown overload situation would be accelerated from 2023 to 2006.

If the current flowing through the third remaining 138kV transmission line exceeds the emergency rating of the line, the conductor could heat up and could possibly break down and the line could suddenly be lost. Loss of the third 138kV transmission line feeding the Downtown area would result in loss of electricity service to 26% of HECO's customers. The damage caused to the failed transmission line from the overload could lead to a continuous prolonged outage of the line in order to perform the repairs, placing HECO at risk of an additional overload situation. The Halawa-Iwilei, Halawa-School and the Makalapa-Airport-Iwilei 138kV transmission lines feeding the Downtown area 138kV substations do not have overcurrent protection schemes in place. Similar to the Koolau/Pukele overload situation, the Supervising Load Dispatcher or any higher-ranking System Operation personnel may, at their discretion, take precautionary measures and intervene by shedding load using 12kV and 46kV distribution feeders in the Downtown area to decrease the current flow through the remaining line to a level that does not exceed the emergency rating of the line.

Downtown Substation Reliability Concern

There are three downtown area substations with only two 138kV transmission feeds, including the Archer and the Kewalo Substations, and the Kamoku Substation has only

one 138kV transmission feed.

The Archer Substation is one of the newer transmission substations on the HECO system, and is fed from the Iwilei and School Street Substations by two underground 138kV lines. These underground lines are considered relatively reliable and are relatively new, however, a catastrophic underground duct bank failure could result in loss of power to the Archer Substation for some time depending on the severity of the failure. Installing a third line to the substation would increase the reliability of the substation.

The Kewalo Substation is also one of the newest transmission substations and is located on Kona Street. Two 138kV underground transmission lines supply power to Kewalo Substation. Kewalo serves customers at the distribution voltage of 25 kV in the Kakaako area. A catastrophic failure to the underground duct bank could result in loss of power to the Kewalo Substation. A third 138kV transmission line to Kewalo Substation would increase the reliability of the substation.

The Kamoku Substation is the newest transmission substation and is located on the corner of Date Street and Kapiolani Boulevard. Kamoku Substation is fed from one 138kV underground transmission line, which brings the power from Archer Substation via Kewalo Substation to Kamoku. The entire Kamoku Substation has a 25 kV back up system. If the 138kV transmission line feeding the substation should fail, then the Kamoku Substation load would be transferred to Kewalo Substation.

If the two 138kV feeds to Kewalo Substation experience an outage, then both the Kewalo and Kamoku Substations would be unable to serve the load. The Kewalo and Kamoku Substations provide service to portions of Ala Moana Shopping Center, several high-rise luxury condominiums in the area and the Hawaii Convention Center. A second 138kV transmission line

to Kamoku Substation would increase the reliability of the substation and provide a second 138kV feed and a third path of electricity for the substation.

The concerns regarding the reliability of the three downtown substations are not as critical as the concerns regarding the Koolau-Pukele line overload and the Pukele Substation reliability. The underground lines serving the substations are relatively new, the line segments between the substations are shorter than the Koolau-Pukele 138kV lines, which reduces the exposure to outages, and the Pukele Substation is the most heavily loaded substation on the HECO system. Also, the two transmission lines serving the Pukele Substation cross the Koolau Mountains. The very difficult access to the lines, their exposure to corrosive marine air, and the location of the two lines on a common right of way causes the Pukele transmission lines to be at a relatively higher risk for an extended outage than the transmission lines in other areas of the island.

Selection of Alternative

In selecting an alternative to address the transmission problems, various studies and reports were updated and developed. The major factors identified and considered to evaluate various alternatives and to compare them against each other were effectiveness, timeliness, cost, construction and other impacts, and public sentiment.

HECO selected the Kamoku 46kV Underground Alternative – Expanded to address the transmission problems and proposes to implement the project in two independent phases. (See Mr. Joaquin's testimony, HECO T-1.) The first phase is estimated to be implemented in 2006 to address the Koolau/Pukele Overload Situation in a timely manner and partially address the Pukele Substation and Archer Substation Reliability Concerns. The second phase is estimated to be implemented in 2008 to fully address the Pukele Substation Reliability Concern.

The implementation of this alternative would allow electrical loads currently being served exclusively from Pukele Substation, located at the end of the Northern 138kV transmission corridor, to also be served from Kamoku Substation and Archer Substation, located in the Southern 138kV transmission corridor. Essentially, this alternative allows load to be shifted among the three substations and also allows the substations to back up each other. These operating features will address the four transmission problems.

First, some of Pukele Substation's existing electrical load would be shifted to Archer Substation and Kamoku Substation with the implementation of this alternative. This reduces the overall Koolau/Pukele Service Area load, which relieves the potential overload situation of the 138kV transmission lines transporting power to the area.

Second, the loads transferred from Pukele Substation to Archer Substation and Kamoku Substation because of the implementation of this alternative, including some existing load currently served by Archer Substation, could temporarily be shifted back to Pukele Substation. This reduces the load in the Downtown Area, which defers the potential overload situation of the 138kV transmission lines transporting power to the area. This would only be done when there is a possibility that the overload situation would occur. After the situation has passed, load would be shifted back from Pukele Substation into the Downtown Area.

Third, some of Pukele Substation's existing electrical load would be shifted to Archer Substation and Kamoku Substation with the implementation of this alternative. Therefore, if the two 138kV transmission lines serving Pukele Substation were to be lost, the loads that were transferred to Archer Substation and Kamoku Substation because of this alternative would not experience an outage. The loads that continue to be served by Pukele Substation even after the implementation of this alternative would experience a momentary

outage (approximately six seconds) as these loads are automatically transferred to Archer Substation and Kamoku Substation.

Fourth, if the two 138kV transmission lines that serve Archer Substation are lost, some of the loads served by Archer Substation, Kewalo Substation, and Kamoku Substation would experience an outage but other Archer Substation loads would experience a momentary outage (approximately six seconds) as these loads are automatically transferred to Pukele Substation.

VII

Identified Alternatives

Early on in the project, HECO identified fourteen 138kV and two 46kV transmission system alternatives to address the transmission problems. The preferred alternative was a partial underground, partial overhead 138kV transmission line connecting Kamoku Substation to Pukele Substation via Waahila Ridge called the Kamoku-Pukele 138kV Transmission Line. (See the testimony of Mr. Wong in HECO T-2.) This alternative is fully described in Exhibit 4, the *Kamoku-Pukele 138-kV Transmission Line Project, Revised Final Environmental Impact Statement*, September 2000, Volumes 1A and 1B. After an extensive public input process, environmental impact statement ("EIS") process and contested case hearing to secure a Conservation District Use Permit ("CDUP") for the project, the State Board of Land and Natural Resources denied HECO's permit request on June 28, 2002. Therefore, the Kamoku-Pukele 138kV Transmission Line was no longer a viable option.

Moving forward, past alternatives considered during the EIS process were reevaluated and new alternatives were identified to address the transmission problems. The following transmission alternatives were evaluated but were screened out for various reasons:

School-Pukele 138kV Alternative

This alternative involves the installation of an underground 138kV transmission line between the School Street Substation in Liliha and the Pukele Substation and an underground 138kV transmission line between the School Street and Kamoku Substations. This alternative effectively addresses all the East Oahu transmission problems. The facilities required are much more extensive than the Kamoku-Pukele 138kV Underground Alternative (discussed further in this Application), which provides similar effectiveness in addressing the transmission problems. Thus, this option was not considered any further.

Halawa-Pukele 138kV Alternative

This alternative involves the installation of an overhead 138kV transmission line between the Halawa Substation in Halawa Valley and the Pukele Substation and an underground 138kV transmission line between the School Street and Kamoku Substations. This alternative effectively solved all the East Oahu transmission problems except for the Downtown Overload Situation in the event the Honolulu Power Plant is not operational in the near future. The facilities required for this alternative are much more extensive than the Kamoku-Pukele 138kV Underground Alternative, which better addresses the transmission problems. Thus, this option was not considered any further.

Halawa-Koolau-Pukele 138kV Alternative

This alternative involves the installation of an overhead 138kV transmission line between the Halawa and Koolau Substations, an overhead 138kV transmission line between the Koolau and Pukele Substations, and an underground 138kV transmission line between the School Street and Kamoku Substations. This alternative effectively solved all the East Oahu transmission problems except for the Downtown Overload Situation in the event the Honolulu

Power Plant is not operational in the near future. The facilities required for this alternative were much more extensive than the Kamoku-Pukele 138kV Underground Alternative, which better addresses the transmission problems. Thus, this option was not considered any further.

Network Alternative

This alternative involves the installation of a partial overhead/partial underground 138kV transmission line between the Halawa and School Street Substations, eight underground and overhead 46kV lines in the Moiliili and Kaimuki areas, and four transformers at the Kamoku Substation. This alternative solved all the East Oahu transmission issues except that it only partially addresses the Archer Substation Reliability Concern. This alternative requires facilities that are much more extensive than the Kamoku-Pukele 138kV Underground Alternative, which better addresses the transmission problems. Thus, this option was not considered any further.

Radial 46kV Alternative

This alternative involves the installation of six underground 46kV lines, two transformers at the Kamoku Substation, one transformer at the Archer Substation, four 46kV circuit breakers at the Pukele Substation and modifications to the control house at the Pukele Substation. This alternative solved the Koolau/Pukele Overload Situation, defers the Downtown Overload Situation, and fully addresses the Pukele Substation and Archer Substation reliability concerns. If the Honolulu Power Plant is not operational in the near future, this alternative would not be able to address the Downtown Overload Situation. This alternative is similar in effectiveness to the Kamoku 46kV Underground Alternative – Expanded (proposed project). The cost of this alternative is slightly higher than the Kamoku 46kV Underground Alternative – Expanded and involves the installation of one more transformer, with marginal benefits. Thus, this option was not considered any further.

In 2003, HECO identified three additional transmission system alternatives that could address the transmission problems in varying degrees. These alternatives were presented to the community as part of an extensive public input process. (See Mr. Alm's testimony, HECO T-12.) The first alternative, called the Kamoku-Pukele 138kV Underground Alternative, was an all-underground 138kV transmission line connecting Kamoku Substation to Pukele Substation utilizing existing public right-of-ways. The second alternative, called the Kamoku 46kV Underground Alternative, involves the installation of six underground 46kV lines in public right-of-ways, a 138-46kV transformer installation at Kamoku Substation, and various modifications of existing distribution substations. The third alternative, called the Kamoku 46kV Underground Alternative – Expanded, involves the same scope of work as the second alternative but also involves the installation of three underground 46kV lines in public right-of-ways and a 138-46kV transformer installation at Archer Substation.

From an engineering standpoint, the Kamoku-Pukele 138kV Underground Alternative is the best long-term solution for solving all of the transmission overloads and reliability concerns outlined earlier. It is estimated that this alternative could be implemented in 2010. Thus, there is a vulnerability period to the Koolau/Pukele Overload Situation (starting in 2005) as this alternative is being implemented.

The Kamoku 46kV Underground Alternative is adequate to reduce the Koolau/Pukele line overload situation, defers the Downtown Overload Situation for several years, provides partial back-up of the load served by the Pukele Substation (although some customers would still incur a 6-second outage if the second Koolau-Pukele 138kV transmission line experienced a forced outage while the first Koolau-Pukele 138kV line was out for maintenance), and provides partial back-up of the load served by the Downtown Substations. If

the Honolulu Power Plant is not operational in the near future, this alternative would not be able to address the Downtown Overload Situation. It is estimated that this alternative could be implemented in 2006. The advantage of this alternative is that it can be installed sooner, although the duration of its effectiveness is not as long as that of the Kamoku-Pukele 138kV Underground Alternative.

The Kamoku 46kV Underground Alternative – Expanded effectively addresses the Koolau/Pukele Overload situation, defers the Downtown Overload Situation, and fully addresses the Pukele Substation and Archer Substation Reliability concerns. If the Honolulu Power Plant is not operational in the near future, this alternative would not be able to address the Downtown Area Overload Situation. It is estimated that this alternative could be implemented in 2008 if the entire scope of work is done simultaneously. Thus, there is a vulnerability period to the Koolau/Pukele Overload Situation (starting in 2005) as this alternative is being implemented. The advantage of the Kamoku 46kV Underground-Expanded alternative is that it can be installed sooner than the Kamoku-Pukele 138kV Underground Alternative, although it will require more time to install this alternative (unless this alternative is installed in two phases as is now planned) than the non-expanded Kamoku 46kV Underground Alternative. The duration of its effectiveness is not as long as that of the Kamoku-Pukele 138kV Underground Alternative, however, it provides complete back up to the Pukele Substation, which is one of HECO's primary concerns.

In addition to effectiveness, other major considerations that differentiated the three alternatives from one another were timeliness, cost, and public sentiment. The 46kV alternatives appear to have less schedule uncertainty and are less costly to implement when compared to the 138kV alternative. From the public input process, it was clear that the business community

supports improved power reliability to Waikiki and surrounding areas but cost was a concern. Although occurring in different locations, construction and other impacts were similar among the three alternatives presented in the public input process. Therefore, these impacts were not as significant considerations in selecting the proposed project as compared to effectiveness, timeliness, cost, and public sentiment.

Balancing all the issues, the Kamoku 46kV Underground Alternative – Expanded was selected over the Kamoku-Pukele 138kV Underground Alternative and Kamoku 46kV Underground Alternative. Furthermore, it was recommended that the selected alternative be implemented in two independent phases and that a voluntary environmental assessment be done for the project (as is addressed in Part XV of this Application). Implementing the proposed project in two phases would address near-term transmission problems such as the Koolau/Pukele Overload Situation and a part of the Pukele Substation Reliability Concern, which includes Waikiki, in a timely manner (2006).

VIII

Cost Estimate

Phase 1 is targeted for completion in 2006 at an estimated cost of approximately $41,587,000. Phase 2 is targeted for completion in 2008 at an estimated additional cost of approximately $13,837,000. The entire project has a total estimated cost of approximately $55,424,000. Attached, as Exhibit 2, is HECO's "Cost Estimate," showing a summary of the capital expenditures anticipated to complete this work. Attached, as HECO T-9, is the written testimony of Ms. Oshiro, which discusses in further detail the development of the cost estimate.

IX

Other Options Considered

In addition to the alternatives identified in Section VII, other options were considered to address the transmission problems. (See Ms. Ishikawa's testimony, HECO T-4.) These options can be categorized into two broad categories: 1) Options that might address all of the East Oahu Transmission problems collectively and 2) Options that might only address the Koolau/Pukele Overload Situation.

In 1995, CH2M Hill (HECO's contractor for the EIS for the proposed Kamoku-Pukele 138kV Transmission line), with input from HECO and the Community Advisory Committee established for the project in early 1993, conducted a review and analysis of alternatives to a 138 kV transmission line between the Kamoku and Pukele Substations. The 1995 CH2M HILL Alternatives Study was included in the Final EIS (in Volume 2) as Appendix C1. (This study also evaluated a number of 138 kV and 46 kV line alternatives to installing a 138 kV transmission line between the Kamoku and Pukele Substations.) The study was updated in April 2000, and the update is contained in Section 10-A of the Final EIS (in Volume 1A). The study update reflects the results of a Review of the Distributed Generation Alternatives to the Kamoku-Pukele Line ("DG Alternatives Study") completed by HECO in March 2000. The results of the 1995 alternatives analysis, as updated in 1995, are described on pages 3-49 through 3-62 of the Final EIS.

The 1995 Alternatives Study, as updated in 2000, reviewed the feasibility and practicality of the installation of generating facilities in the Koolau/Pukele service areas that use renewable resources, the implementation of such large amounts of demand side management and load management measures, and the installation of substantial amounts of distributed generation

("DG") in the Koolau/Pukele service area to displace the need for a 138kV transmission line connecting the Pukele and Kamoku Substations.

The four transmission concerns included the Koolau/Pukele and Downtown Overload Situations, the Pukele Substation Reliability Concern, and the Downtown Substation Reliability Concern. In general, the analysis concluded that, for reasons related to cost, feasibility, practicality and effectiveness, the transmission line was the preferred alternative. For example, none of the options could resolve the Pukele Substation Reliability Concern, unless the entire load (for approximately 60,000 service accounts) in the Pukele service area could be displaced, or backed up in the event of a loss of the two 138 kV transmission lines currently providing power to the Pukele substation. The analysis indicated why displacing or backing up the Pukele service area load would be infeasible and/or impractical (due to factors such as the lack of available sites), particularly in the near-term, or cost-prohibitive if the siting and other feasibility issues could be resolved.

HECO has analyzed in more detail the possible options (other than constructing a new 138 kV transmission line, or new 46 kV sub-transmission circuits) for addressing the Koolau/Pukele Overload Situation, even if the options would not resolve the Pukele Substation Reliability Concern. The options analyzed include increasing the current carrying capacity of existing lines (at least for planning purposes), and reducing the Koolau/Pukele service area load (or peak load) by targeting additional DSM, load management, DG and combined heat and power ("CHP") system penetration in the service area (beyond that expected to result from current programs and efforts). The analysis is included in the study finalized by HECO's Planning & Engineering Department in December 2003 entitled "East Oahu Transmission Project: Options to the Koolau/Pukele Transmission Line Overload Problem" ("Koolau/Pukele

Overload Options Study").

Some of the options considered to address all of the East Oahu Transmission problems collectively were:

Live Line Maintenance

HECO retained a consultant, EDM International, Inc. ("EDM"), to review the potential for and practicability of doing "live line maintenance" on Oahu. Live line maintenance (which is generally referred to as "live working" in the industry) involves doing maintenance work on (and even replacing) distribution and transmission facilities without de-energizing the distribution and transmission lines. EDM and its Project Team, including Andy Stewart, Dr. George Gela of EPRISolutions, Inc., and Thomas Harrington and Louis Benedict of TLH Management Services Inc., were asked to analyze in more detail the potential for doing live working ("LW") on the 138 kV transmission lines serving the Koolau and Pukele substations, since the Koolau overload situation and the Pukele reliability concern generally (although not exclusively) arise when a transmission line has to be taken out of service (i.e., be de-energized) for maintenance. The Project Team's conclusions are summarized in the testimony of Mr. Stewart in HECO T-5.

In the case of HECO's 138 kV system as it is currently configured, LW has, at best, very limited applicability, particularly for the lines serving the Koolau and Pukele Substations, due to constraints imposed by climate, terrain, and facility conditions. These constraints render LW impracticable for all but a very small percentage of the needed maintenance activities. The very frequent occurrence of rain and periods of fog, high humidity and unpredictable winds often will prevent the safe use of LW. Remote structures, particularly in the Koolau mountain areas, cannot be accessed by heavy equipment and/or do not have sufficiently large flat areas for use of

heavy equipment such as insulated aerial devices with outriggers. Helicopter use is often hindered by fog, rain and strong winds. Many structures lack sufficient mechanical strength to support additional loading posed by climbing and conductor supports (strain sticks) needed for removal of insulators, and would need to be refurbished before LW should be attempted. Few of HECO's lines were designed with the goal of facilitating LW. In particular, none of the lines serving the Koolau and Pukele Substations, which are more than 40 years old, were designed for LW. For this reason, LW is not possible in many situations without prior retrofitting of the existing lines. Taking the lines out of service to retrofit the structures would place the Pukele service are at risk of the very double outage that LW would be attempting to avoid. Also, in most cases LW on HECO's system will be more time consuming and costly than de-energized maintenance.

Renewable Resources

In general, the 1995 Alternatives Study, as updated in 2000, found that renewable resource generating plants were not a viable alternative due to the lack of suitable sites, the large land requirements, the non-firm nature of wind and solar resources, and the costs and need for interconnection lines if suitable sites could be found and battery energy storage systems were added to firm up the resources.

Distributed Generation ("DG")

DG refers to the installation of small generating units located at or near the load demands. Various technologies such as internal combustion engines ("ICE") (which in Hawaii are often diesel generators), fuel cells, micro-turbine generators, and renewable energy generators (wind and photovoltaic) are oftentimes suggested for DG applications. The purpose of the DG Alternatives Study completed by HECO in March 2000 was to review the suitability of using DG

as an alternative to the installation of the Kamoku-Pukele 138 kV transmission line. In principle, installation of DG resources can defer the need for new transmission and distribution ("T&D") capacity by providing customers with a nearby redundant source of electricity that otherwise would have been provided by T&D upgrades. For DG to provide the same reliability improvements as the Kamoku-Pukele line, it was estimated that at least 200 MW of distributed generation would have to be installed up front in the neighborhoods of Manoa, Palolo, Waialae/Kahala, Kaimuki, Kapahulu, McCully/Moiliili, and Waikiki (of which 39 MW was already assumed to be installed[4]). The review concluded that DG was not a suitable alternative to the Kamoku-Pukele line due to the cost of this option, as well as uncertainties with land, fuel supply, interconnection, and permitting with the installation of small generating units in the Pukele Substation service area.

HECO formulated a variety of scenarios to implement DG as a practical alternative to the Kamoku-Pukele 138kV transmission line project, all of which assumed that at least 39 MW of emergency capacity already exists and would be available for this purpose in the Pukele substation service area. These scenarios included the installation of all ICEs, all-microturbines, all-fuel cells, and a portfolio (combination) of ICEs, microturbines, and fuel cells.[5]

The least costly DG scenario was the installation of all ICEs, which had an estimated capital installed cost ranging from $81 million to $161 million. The DG scenarios

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[4] The peak Pukele Substation load is approximately 200 megawatts. HECO's "Review of the Distributed Generation Alternatives to the Kamoku-Pukele Line" study, March 2000, assumed that approximately 39 megawatts of emergency generators already exists in the Pukele Substation service area.

[5] The fuel cell technologies reviewed in the study were under various stages of development, and only phosphoric acid fuel cells were commercially available at the time. (Commercial production of these fuel cells, however, has now been discontinued.) There remain a number of key issues that need to be overcome before commercialization of the various fuel cell technologies can occur, including successful scale-up, manufacturing costs, durability, and reliability.

with the installation of all fuel cells and all microturbines had estimated capital installed costs ranging from $161 million to $805 million, and from $145 million to $258 million, respectively. The portfolio of ICEs, microturbines, and fuel cells scenario ranged from $122 million to $343 million. The actual capital costs would probably be in the middle of the ranges, because of expected variations in the site-specific and customer-specific installation requirements.

The other practical issues associated with the implementation of a DG portfolio that cause it to be an impractical alternative, included:

- Fuel Supply – Most of the DG technologies discussed utilize natural gas as fuel, which is not available in Hawaii. Synthetic natural gas (SNG), a petroleum product, is only available in certain areas of the Pukele Substation Service Area. DG technologies that utilize propane or diesel will require the installation of fuel storage tanks throughout the Pukele Substation Service Area.

- Siting – The Pukele Substation Service Area is highly urbanized and developed. Therefore, finding adequate space for the DG installations and associated fuel infrastructure, on or near the customer's site, will be difficult given Hawaii's high land cost and competing land uses.

- Operations and Maintenance – The operation and maintenance of hundreds to thousands of DG installations will be a significant resource challenge and added expense.

- Electrical Interconnection – The implementation of DG, on the scale and magnitude needed to replace the Kamoku-Pukele line, would be unprecedented. Therefore, there are numerous electrical interconnection issues that need to be resolved before DG on this scale could be implemented, such as power quality, system protection, control/communication, and electrical switching issues.

- Permitting – The installation of DG would involve various permits and approvals, depending on the locations and size of the installations. These approvals will require that noise, visual, water discharge, hazardous waste, and emissions impacts are fully addressed.

- Other Costs – When one of three transmission lines feeding the Koolau Substation Area is outaged for maintenance, only a portion of the 200 MW of distributed generation will be needed to forestall the overloading problem that occurs when a second line is lost. The required DG output may reach 40 MW, which was estimated to cost $300,000 to $2 million annually in fuel. When one of the two transmission lines feeding Pukele Substation is outaged for maintenance, however, all 200 MW of DG will be required to

prevent the Pukele customers from being blacked out if the remaining transmission line is outaged too. Running all 200 MW of DG was estimated to cost from $1.6 million to $10 million annually for fuel. The cost of DG fuel is more expensive than centralized power plant fuel. Even though DG can help reduce transmission line losses by requiring the use of less fuel at the centralized power plants, the cost of utilizing more expensive DG fuel will offset any savings realized from reduced line losses.

- Load Diversity – The 200 MW customer load served by Pukele Substation is a "coincident" value that takes into account the fact that not all customer loads peak at the same time. If DG is implemented in a manner such that each customer or small block of customers have their own DG device, then the DG devices will not be able to share loads among each other. Based on the customer composition in the Pukele Substation Service Area, 350 MW of DG capacity may need to be provided instead of 200 MW. This load diversity issue could significantly escalate the costs for implementing DG and, thus, make it even more impractical.

DSM and LM

HECO implemented five energy-efficiency DSM programs, including two residential and three commercial and industrial ("C&I") programs, in 1996 after Commission approval. (The programs are identified in Section 3.5.11 of the Revised FEIS.) The five programs were included in HECO's first integrated resource plan ("IRP Plan"), which was approved by the Commission in 1995. Modifications to the DSM programs were proposed in HECO's second IRP Plan filed in January 1998, but the existing programs have continued in effect (with modifications to reflect changes in the City and County of Honolulu's model energy code) as a result of stipulations approved by the Commission. Energy-efficiency DSM programs attempt to encourage customers to conserve electrical use by providing financial incentives for the installation of more efficient electrical equipment, or solar water heaters.

HECO has filed applications for approval of two load management ("LM") programs, including a Residential Direct Load Control Program, filed June 6, 2003 in Docket No. 03-0166, and a C&I Direct Load Control Program, filed December 11, 2003 in Docket No. 03-415. The LM programs target peak load reduction, rather than energy conservation. Under

the programs, participating customers will receive a financial incentive in exchange for allowing their water heating load (in the case of residential customers) and a specified portion of their demand in the case of C&I customers to be interrupted when there is insufficient generation to meet a projected peak demand peak, and when HECO's system frequency decreases to a specified level (due to the trip of a generating unit). The purpose of the programs is to help defer the need for peaking generation and possibly to displace the need to operate as much spinning reserve.

The impacts of the DSM measures implemented to date pursuant to the five energy efficiency DSM programs are reflected in the actual load data through 2003, and the forecasted future impacts of the energy-efficiency DSM programs are reflected in the forecasted loads in the August 2002 sales and peak load forecast. These impacts, and the impacts of the LM programs (which have not yet been approved, but are assumed to be implemented in 2004 for purposes of the plan), are addressed in HECO's 2002 Evaluation Report, filed December 31, 2002 in Docket No. 95-0347, which was filed as an evaluation of HECO's Second IRP Plan (which was filed on January 30, 1998).

HECO also filed an application for approval of a Residential Customer Energy Awareness Pilot Program on May 15, 2003 in Docket No. 03-0142. If approved, the program will allow HECO to do market research and survey the current level of residential energy awareness, to implement a multi-facet communications program regarding energy efficiency, and to re-survey the level of energy awareness.

The 1995 Alternatives Study, as updated in 2000, indicated that the transmission overload problems might be deferred for a few years by even more aggressive (but not necessarily cost-effective) DSM programs, but the problems would only reappear due to overall

load growth in the service areas, the customer mix, and the already high saturation goals for the approved DSM programs.

With the exception of more efficient commercial lighting and solar water heating, which are already included in the program, most DSM resources in Hawaii can only be cost-effectively implemented when existing equipment (motors, air conditioners) residential appliances are at or near the end of their useful lives. While there may be high technical potential for increased efficiency, the implementation rate of such measures is limited by the high capital cost of installing new end use equipment.

The 1995 Alternatives Study, as updated in 2000, recognized that DSM and LM programs could not address the Pukele reliability concern, since these resources could not provide either the Pukele substation with a reliable and cost-effective source of electricity equivalent to its peak load, or eliminate all of the customer load in the Pukele service area.

Some of the options considered in the Koolau/Pukele Overload Options Study to only address the Koolau/Pukele Overload Situation were:

Increase Conductor Capacity Options

Increasing Conductor Capacity involves the implementation of various techniques, materials, and equipment to increase the line capacities of the existing transmission lines. These alternatives were not considered viable to address the Koolau/Pukele Overload Situation.

The options to increase the current carrying capacity of transmission lines can be problematic and would place the HECO system at an increased risk of experiencing an overload situation. For example, the re-conductoring option would require that large, heavier conductors be installed to replace the existing conductors on the three 138 kV transmission lines serving the Koolau Substation, and various structure and poles supporting the conductors may have to be

strengthened or replaced. The process would be time consuming, difficult and expensive, particularly given the logistics of stringing new conductors in the mountainous areas traversed by the lines. The work would necessitate prolonged outages of the lines, which would increase the possibility of an overload occurring if a second line serving the Koolau Substation becomes unavailable for any reason.

Reduced Demand Options

Reduced Demand involves the implementation of initiatives and programs such as DSM programs to reduce power demand at customer sites. These alternatives were not considered viable to address the Koolau/Pukele Overload Situation. These alternatives rely on targeted market penetration of DSM and LM initiatives and programs in the Koolau/Pukele Area. At this time, there is not enough reliable data to determine whether an adequate market exists for these programs to be effective for the overload situation.

DG Options

DG was not considered viable to address the Koolau/Pukele Overload Situation because of the uncertainties with land, fuel supply, interconnection, and permitting with the installation of small generating units in the Koolau/Pukele Area.

Combined Heat and Power Options

Combined Heat and Power ("CHP") systems are a form of DG that utilize waste heat from the power generation process as energy (heat or steam) for heating or cooling purposes. The advantage of a CHP system over conventional electric generating units is the increased efficiency obtained when the captured waste heat is put to useful purposes. The thermal efficiency of fuel usage typically ranges from 85 to 90% for a CHP system compared to 35 to 40% for conventional central station generating units.

HECO and its electric utility subsidiaries serving the counties of Maui and Hawaii, filed an application on October 10, 2003 in Docket No. 03-0366 requesting approval of each company's proposed CHP Program and related tariff provision (Schedule CHP, Custom-Sited Utility-Owned Cogeneration Service). Under the CHP Program and Schedule CHP, the companies propose to offer CHP systems to eligible utility customers on the islands of Oahu, Maui and Hawaii as a regulated utility service. (The companies also indicated that they would request approval on a contract-by-contract basis for CHP system projects that fall outside the scope of the proposed program.) If the program is approved, HECO anticipates that the program will accelerate the rate at which CHP systems are installed on Oahu, and projects that HECO and third parties would install 10 MW by the end of 2006, and another 15 MW could be installed by the end of 2010. This contrasts with the assumed rate for DG penetration in HECO's August 2002 load forecast of 1 MW per year (or 7 MW from 2004 through 2010). The 2003 East Oahu Alternatives Study includes an analysis of the possible impact of this aggressive CHP Program on the load forecast used for the EOTP analyses.

How much of this forecasted amount would be installed in the Koolau/Pukele area is uncertain, although the Koolau/Pukele offers greater opportunities compared to residential communities on the Leeward or Windward areas of Oahu. Even if it was assumed that all of the forecasted CHP installations occurred in the Koolau/Pukele area, the 42 MW required in 2022 would be inadequate to meet the 47 MW required to resolve the Koolau/Pukele Overload Situation. This option assumes for planning purposes that there is a potential for CHP installations at commercial and industrial sites within the Koolau/Pukele Service Area in addition to those already forecasted to be installed as a result of HECO's filed CHP program and third party efforts..

CHP options were not considered viable to address the transmission overload situation, given the expected difficulties and cost of acquiring the additional CHP needed.[6]

Combined Alternatives

In theory, it might be possible to defer, but probably not eliminate, the Koolau/Pukele Overload Situation through some combination of targeted DSM, DG, and CHP installations in the Koolau/Pukele service area. However, there would be substantial uncertainty as to whether the objective could be achieved, given the practical problems with substantially increasing the amount of DSM, DG and/or CHP installed in the area in the near-term, particularly in light of the fact that the overload problem could occur in 2004 during daytime peak periods, and is already at risk of occurring during evening peak periods. The total cost of deferring the overload problem using such measures would probably exceed the cost of the preferred 46kV expanded alternative (which will fully address the Pukele Substation Reliability Concern, with the exception of the customers that will still incur 6-second interruptions). And, the DSM, DG and CHP option would not address the Pukele Substation Reliability Concern (with the possible exception of the customers with on-site DG or CHP, assuming their loads could be islanded), or help with the Downtown Overload Situation if the Honolulu Power Plant is unavailable for any reason.

The question is not really whether HECO should pursue cost effective DSM and CHP programs, or add cost effective renewable resources, or maintain and improve the reliability

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[6] Customers can achieve added benefits if CHP systems can be installed when they are renovating or adding to their commercial facilities, when they are planning to replace existing equipment (such as chillers), and/or when they are planning new commercial facilities. Many customers will not make a decision to move forward with a CHP project until they have some stimulus such as aging equipment that needs to be replaced or changes in their operating conditions that require additional central plant investment.

of our transmission system. HECO should pursue all of these objectives. HECO is aggressively promoting the installation of cost effective DSM measures through its Commission-approved DSM programs, and has filed new LM programs. HECO is seeking approval of a major CHP program, which would place HECO and its subsidiaries at the forefront of utilities promoting the installation of energy efficient CHP systems, if the program is approved. HECO and its subsidiaries, including its new renewable energy subsidiary, are actively seeking to acquire capacity and energy generated from renewable resources at both the utility and customer (through solar water heating) levels.

Nonetheless, neither DSM, nor CHP (and DG), nor renewable resources can eliminate or cost effectively address the East Oahu transmission problems and concerns that will be addressed by the proposed 46 kV project.

X

Schedule

Given the material lead times and the City and State permits and approvals required for this project, HECO is targeting to put Phase 1 of the Kamoku 46kV Underground Alternative – Expanded in service by December 2006, and to put Phase 2 in service by December 2008. Attached as Exhibit 3 is the proposed project schedule.

There may be potential scheduling conflicts with Phase 2 due to various City initiated projects planned for installation in King Street beginning as early as 2004 and as far out as 2015. Over the years, the City Neighborhood Boards have requested that various government and private entities coordinate construction of their respective projects to minimize impacts to the community. For technical and safety reasons, it is oftentimes not feasible to install different types of utilities in the same trench. Furthermore, budgetary, resource, or permitting constraints

normally limit when projects can proceed. Thus, community concern for numerous construction projects on King Street may influence coordination efforts between the various HECO and City projects. This may affect when construction of Phase 2 is actually started and completed. (See HECO T-6, the written testimony of Mr. Wong, which discusses the schedule and schedule uncertainties associated with the project.)

XI

Project Impacts

The following potential impacts have been identified for the proposed project:

Construction

The potential traffic and noise impacts would be short-term and similar to those for other underground transmission line projects done in the past. (See Mr. Harrington's testimony, HECO T-8.) These impacts can be mitigated to a certain degree with proven construction work practices. Access to businesses and residences may be impacted in the work areas but shall be maintained throughout the duration of construction. Dust impacts, if any, should be minimal because most of the work would be on existing paved roadways. A 24/7 project hotline shall be established for the public so that questions or complaints can be responded to as quickly as possible.

Electric and Magnetic Fields

Electric and Magnetic Fields ("EMF") exist when electricity is present in a conductor. HECO follows a policy of "Prudent Avoidance" as defined by the Commission in its Decision and Order No. 13201 (issued April 7, 1994) in Docket No. 7256: "Prudent avoidance is an approach to making decisions about risks. (See Mr. Bonnet's testimony, HECO T-11.) This decision-making process is based on judgment and values, can be applied to groups and

individuals, and can be considered for all aspects of our lives, not just EMFs. Prudent avoidance applied to EMFs suggests adopting measures to avoid EMF exposures when it is reasonable, practical, relatively inexpensive and simple to do so. This position or course of action can be taken even if the risks are uncertain and even if safety issues are unresolved." HECO will apply prudent avoidance in the engineering design and route planning for the new 46kV underground lines for this proposed project. (See Mr. Silva's testimony, HECO T-10.)

Calculation were performed for the potential EMF levels under maximum, normal and emergency conditions for the new 46kV underground lines proposed for this project. (See Mr. Silva's testimony, HECO T-10.) The levels calculated are similar to other existing underground 46kV lines. For the two 46kV circuits between Makaloa Substation and McCully Substation (Phase 1) and the three 46kV circuits from Archer Substation on King Street (Phase 2), EMF mitigation can be achieved relatively inexpensively by optimizing cable placement and phasing arrangement within the cable ducts.

Because EMF levels from power lines drop off rapidly with distance, generally as a function of the inverse of the distance squared, EMF mitigation can also be achieved by route planning. By locating all the 46kV circuits proposed in this project in the middle of the respective roadways, exposure levels could be reduced at the edge of the roadways, pending approval of such location by City permitting agencies.

XII

General Order No.7

Commission approval to commit funds in excess of $500,000 for this project is sought to commit funds under the provisions of Paragraph 2.3(g)(2) of General Order No. 7, which states in part that "Proposed capital expenditures ... in excess of $500,000 ... shall be

submitted to the Commission for review at least 60 days prior to the commencement of construction or commitment for expenditure, whichever is earlier."

HECO proposes to commit funds for this project with the issuance of purchase orders for long-lead material items, in accordance with Paragraph 2.3(g)(2) of General Order No. 7, on Item Y48500, East Oahu Transmission Project. Phase 1 is targeted for completion in 2006 at an estimated cost of approximately $41,587,000. Phase 2 is targeted for completion in 2008 at an estimated additional cost of approximately $13,837,000. The entire project has a total estimated cost of approximately $55,424,000.

XIII

Underground 46kV Lines

HECO proposes to place the 46kV lines for this project underground. A favorable Commission determination is requested pursuant to HRS Section 269-27.6(a), which provides that:

> "Notwithstanding any law to the contrary, whenever a public utility applies to the public utilities commission for approval to place, construct, erect, or otherwise build a new forty-six kilovolt or greater high-voltage electric transmission system, either above or below the surface of the ground, the public utilities commission shall determine whether the electric transmission system shall be placed, constructed, erected, or built above or below the surface of the ground; provided that in its determination, the public utilities commission shall consider:
>
> (1) Whether a benefit exists that outweighs the costs of placing the electric transmission system underground;
> (2) Whether there is a governmental public policy requiring the electric transmission system to be placed, constructed, erected or built underground and the governmental agency establishing the policy commits funds for the additional costs of undergrounding;
> (3) Whether any governmental agency or other parties are willing to pay for the additional costs of undergrounding;
> (4) The recommendation of the division of consumer advocacy of the department of commerce and consumer affairs, which shall be based on an evaluation of the factors set forth under this subsection; and

(5) Any other relevant factors.

Subsections (b) and (c) of HRS Section 269-27.6, which apply to 138kV or greater lines, do not apply to this project.

As a result, HECO requests that the Commission determine that the new 46kV lines for the East Oahu Transmission Project be built below the surface of the ground. (See Mr. Morikami's testimony, HECO T-7.)

For the most part, it would not be practical or prudent to construct the proposed new 46kV circuits overhead, given State and City laws governing portions of the route, engineering considerations, the history of this project and probable opposition to overhead construction, and the pressing need to resolve the East Oahu transmission system concerns. If certain sections of the new 46kV circuits were proposed for overhead construction, the potential for significant project delays and increased costs would be great. Any potential savings in engineering and construction costs associated with an overhead line proposal could easily disappear if approvals and permits for the project were delayed. Installing the various 46kV circuits underground provides the best opportunity to meet the underlying need for this project in a timely and cost-effective manner.

The requirements of HRS Section 269-27.6 are satisfied by this project. The 46kV lines are being placed underground. HECO is paying 100% of the estimated cost to underground the 46kV lines. HECO is not aware of any other relevant factors in the decision to place the 46kV lines underground. The position of the Division of Consumer Advocacy will be stated upon completion of its investigation.

XIV

Public Hearing

The project involves the construction of underground 46kV subtransmission lines. Therefore, the Commission is not required to schedule a public hearing pursuant to HRS Section 269-27.5, which provides that:

> "Whenever a public utility plans to place, construct, erect, or otherwise build a new 46 kilovolt or greater high-voltage electric transmission system above the surface of the ground through any residential area, the public utilities commission shall conduct a public hearing prior to its issuance of approval thereof. Notice of the hearing shall be given in the manner provided in section 269-16 for notice of public hearings."

However, the Commission may want to consider conducting a public hearing given the unique history of the project, the continued substantial public interest regarding the need for the project, and recent comments regarding the proposed route. The Commission has held public hearings in other dockets, although not required to do so, including Docket No. 02-0060 (sale of assets of Kauai Electric Division to the Kauai Island Utility Co-op) and Docket No. 95-0333 (HELCO's proposal to purchase and install two dispersed generators).

XV

Environmental Assessment

HECO requests that the Commission be the accepting agency for an EA of the project to be voluntarily prepared by HECO and submitted to the Commission in accordance with the HRS Chapter 343 process.

The need for an EA under Chapter 343 of the HRS is determined by the appropriate permitting agency. Based on past experience with permitting and construction of other underground subtransmission or distribution lines rated 46kV and below within existing

roadways, which HECO has the right to use under its franchise, the preliminary schedules for the two 46kV alternatives (included in the recent process to solicit public input on project alternatives) assumed that an EA would not be required by a permitting agency. However, there continues to be substantial public interest and continuing debate and concerns regarding project alternatives, community impacts and project need, and requests for HECO to conduct an EA were made in the follow-up community meetings after HECO's preferred 46kV alternative was announced. Given the circumstances, and the unique history of this project, HECO has decided to voluntarily conduct an EA -- which will provide a formalized process to address these concerns. HECO does not anticipate that an Environmental Impact Statement ("EIS") will be required, but that determination will be up to the accepting agency, which HECO is requesting be the Commission.

An EIS would be prepared if the Commission finds that the proposed action may have a significant effect on the environment. HECO anticipates that a finding of no significant impact will be appropriate, given that the proposed project is not located in areas that are considered environmentally sensitive, and the impacts from the proposed underground project appear to be limited to short-term construction related impacts that can be mitigated.

Conducting an EA, although itself adding some uncertainty and potential for moderate delay and cost impact, should also mitigate to some extent a risk of greater project uncertainty, delay and cost increase brought on by protracted litigation if an EA is not performed. The need to address in a timely and cost effective manner the existing transmission system concerns for the eastern half of Oahu is a major factor in selecting among the proposed project alternatives and developing a plan for its implementation. The estimated schedule impact of conducting an EA appears moderate, although the impact would be substantially greater if HECO

is required to do an EIS.

HECO requests that the Commission be the accepting agency for the voluntary EA, such that it thereby obtains all relevant information on the project before making its determination on the commitment of utility funds and underground construction of the proposed project.

XVI

Integrated Resource Planning

Paragraph III.D.5 of the Commission's Framework for Integrated Resource Planning ("IRP Framework")[7] states, in relevant part, that: "The integrated resource plan and program implementation schedule approved by the commission shall govern all utility expenditures for capital projects, purchased power, and demand-side management programs." As the Commission explained, "expenditures for all capital projects should be made consistent with the integrated resource plan. . . . In essence, an integrated resource plan is intended to 'control, direct, or strongly influence' all capital expenditures." (D&O 11630 at 8.)

Projects do not have to have been included in an approved IRP Plan to be consistent with the plan. With a few exceptions, specific capital expenditures projects are not identified or discussed in an IRP Plan.[8]

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[7] An electric utility's integrated resource plan ("IRP Plan") and program implementation schedule ("Action Plans") are developed and filed pursuant to the IRP Framework (revised May 22, 1992), which was adopted by the Hawaii Public Utilities Commission (the "Commission") by Decision and Order No. 11630 (May 22, 1992) ("D&O 11680") in Docket No. 6617, amending and reissuing the IRP Framework adopted in Decision and Order No. 11523 (March 12, 1992).

[8] The exceptions have been planned central station generating unit additions, which generally are described as generic projects, rather than specific project proposals. They have been described as specific projects when they have already been the subject of review proceedings pursuant to paragraph 2.3(g)(2) of G.O. 7. The plan does not include Independent Power Producer ("IPP") projects, unless there is a signed power purchase agreement for the project. Nonetheless, it is contemplated that IPP firm capacity projects may defer utility generation additions, and

Transmission and distribution ("T&D") projects generally are not explicitly considered in the IRP process. The general assumption is that existing transmission lines will continue to be in service during the planning period, and that new or reconductored lines will be added as necessary or appropriate for reliability purposes and to provide for adequate transmission capacity, taking into account the location of supply-side resources and load growth. However, that does not mean that T&D costs are irrelevant in the IRP process, or that an IRP Plan is irrelevant to transmission planning. Avoided T&D costs may be relevant to evaluating the cost-effectiveness of DSM programs. Transmission interconnection requirements for new generation resources should be considered in evaluating the costs of those resources. In addition, planning for the transmission system is done in a manner that is consistent with, and takes into account, the resource additions in the latest resource plan.

HECO (and its subsidiary electric utilities serving Maui County and the Big Island) do both long-range transmission planning studies for their systems on Oahu, Maui and Hawaii, and transmission planning studies to address specific transmission and subtransmission problems and concerns. This planning process preceded the implementation of integrated resource planning ("IRP") in Hawaii, and has continued after the implementation of IRP. There has never been a requirement that these transmission planning studies, or the projects recommended by the studies, be explicitly included or evaluated in the companies' filed IRP Plans. The Commission has approved a substantial number of these transmission projects. For example, in the case of HECO, the Commission approved the Archer-Kewalo 138kV

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that IPP as-available energy projects may be added to the utility's system even though there is no explicit reference to these projects in the plan.

transmission lines and the Kewalo-Kamoku 138kV transmission line in 1993, the Waiau-CIP 138kV transmission lines in 1994, and the Waialua-Kuilima 46kV subtransmission line in 1996.

In this case, the study that initially identified the East Oahu transmission problems that are being addressed by the proposed project (i.e., the July 1991 "East Oahu 138KV Requirements" study, which was updated in August 1992, again in March 1998, and for a third time in the update finalized in December 2003) preceded not only the filing of HECO's first IRP plan in 1993, but also preceded the implementation of IRP in Hawaii.[9] Thus, this East Oahu Transmission Project is clearly consistent with HECO's first and second cycle IRP Plans, which implicitly assumed that the transmission requirements identified in the studies proceeding the plans would be implemented.[10]

HECO's East Oahu Transmission Project also is consistent with and should further IRP objectives, particularly §5.6 (maintaining reliability) and §5.5 (supporting the Hawaii Energy Objective of achieving dependable statewide energy systems). The objectives are identified and explained in §5.0 of its 2nd IRP Plan.[11]

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[9] The Commission cited the August 1992 update , and its finding that there was a need for a third feed to Pukele Substation in approving the Kewalo-Kamoku 138kV transmission line in 1993.

[10] The proposed project now addresses the transmission reliability problems by connecting the Southern Transmission Corridor to the Pukele Substation through 46kV connections, rather than through the installation of a 138kV transmission line.

[11] HECO's 2nd IRP Plan ("IRP-2") was filed on January 30, 1998, in Docket No. 95-0347. On November 22, 2000, the parties entered into a Stipulation Regarding Hearing and Commission Approval filed January 17, 2001, which disposed of the docket without the need for a hearing, subject to Commission approval. The Commission approved the stipulation in Docket No. 95-0347 by Order No. 18340 dated January 29, 2001. Pursuant to the schedule contemplated by the stipulation, HECO's December 2002 Evaluation Report, which addresses its 2nd IRP Plan, was filed on December 31, 2002, and the Commission opened HECO's third cycle of IRP ("IRP-3") by Order No. 20430, filed September 11, 2003, in Docket No. 03-0253.

XVII

Wherefore, HECO respectfully requests that the Commission:

1) approve the commitment of funds for the proposed East Oahu Transmission Project, Item Y48500, in accordance with Paragraph 2.3(g)(2) of General Order No. 7,

2) determine that the new 46kV lines be constructed below the surface of the ground, pursuant to HRS 269-27.6,

3) be the accepting agency for an environmental assessment to be voluntarily conducted by HECO in accordance with the HRS Chapter 343 process, and

4) grant HECO such other and further relief as may be just and equitable in the premises.

DATED: Honolulu, Hawaii December 18, 2003

HAWAIIAN ELECTRIC COMPANY, INC.

By _____
William A. Bonnet
Vice President, Government and
Community Affairs

STATE OF HAWAII)
) ss.
CITY AND COUNTY OF HONOLULU)

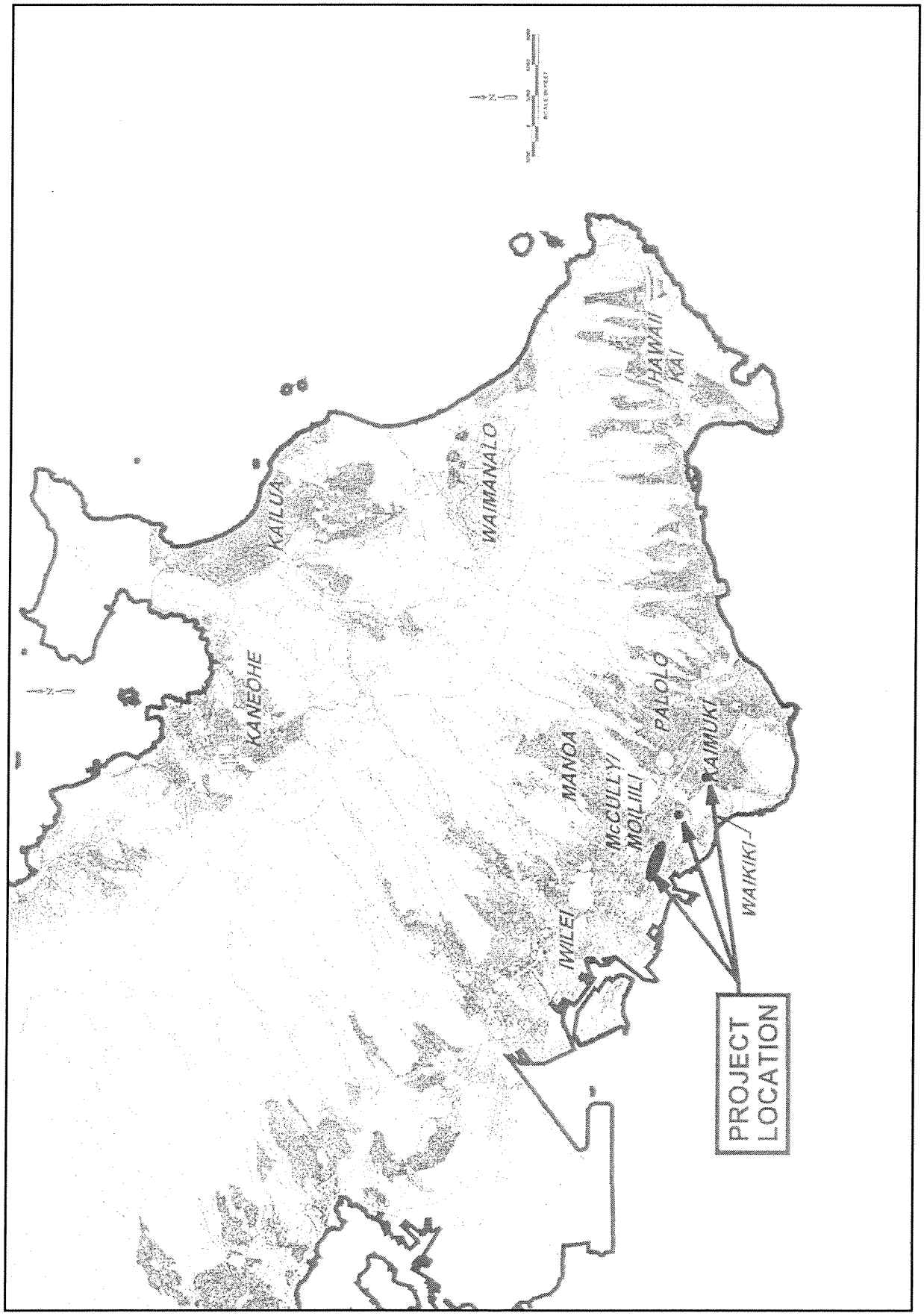
WILLIAM A.BONNET, being first duly sworn, deposes and says: That he is the Vice President-Government and Community Affairs of Hawaiian Electric Company, Inc., Applicant in the above proceeding; that he makes this verification for and on behalf of HECO and is authorized so to do; that he has read the foregoing Application, and knows the contents thereof; and that the same are true of his own knowledge except as to matters stated on information or belief, and that as to those matters he believes them to be true.

William A. Bonnet

Subscribed and sworn to before
me this 18th day of December, 2003

Carolyn Kuwana
Notary Public, First Circuit,
State of Hawaii

My Commission expires October 4, 2006

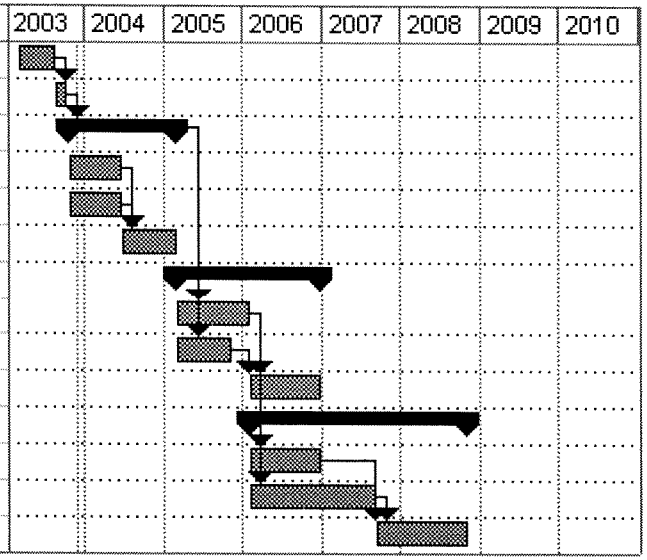

KAILUA
WAIMANALO
HAWAII KAI
KANEOHE
MANOA
McCULLY/ MOILILI
PALOLO
KAIMUKI
WAIKIKI
WILEI
PROJECT LOCATION

COST SUMMARY

Project Title: East Oahu Transmission Project
Budget Item: Y48500

PHASE 1			
46 kV Underground Lines			
Makaloa-McCully UG Line	$11,019,000		
Kamoku Sub Area UG Lines	$1,205,000		
Winam Street UG Line	$1,029,000		
Pumehana Street UG Line	$615,000		
McCully Sub Area UG Line	$670,000		
		$14,538,000	
Kamoku Substation		$23,530,000	
Distribution Substation Modifications			
McCully Substation	$276,000		
Makaloa Substation	$415,000		
Kewalo Substation	$53,000		
Interrupters	$258,000		
Kuhio Substation	$345,000		
Waikiki Substation	$559,000		
Ena Substation	$707,000		
Kapahulu Substation	$906,000		
		$3,519,000	
TOTAL PHASE 1 COST			**$41,587,000**
PHASE 2			
Archer-McCully Underground Lines		$10,133,000	
Archer Substation		$3,704,000	
TOTAL PHASE 1 COST			**$13,837,000**
TOTAL PROJECT COST			**$55,424,000**

ID	Task Name	Duration
1	Public Input on Alternatives	6 mons
2	Selection of Preferred Alternative	2 mons
3	**PUC Approval on Phases 1 & 2**	**18 mons**
4	PUC/CA Information Requests	9 mons
5	Environmental Assessment	9 mons
6	PUC Determinations	9 mons
7	**Ph. 1 - Kamoku 46kV Alternative**	**24 mons**
8	Ph. 1 - Detailed Design/Material Procurement	12 mons
9	Ph. 1 - Permit Drawings/Permit Acquisition	9 mons
10	Ph. 1 - Construction	12 mons
11	**Ph. 2 - Archer Tsf/King St. 46kV UG Lines**	**36 mons**
12	Ph. 2 - Detailed Design/Material Procurement	12 mons
13	Ph. 2 - Permit Drawings/Permit Acquisition	21 mons
14	Ph. 2 - Construction	15 mons



EAST OAHU TRANSMISSION PROJECT
ESTIMATED SCHEDULE

Exhibits 4 to 11 are voluminous and will be provided by separate transmittal.

BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF HAWAII

In the Matter of the Application of	)	
	)	
HAWAIIAN ELECTRIC COMPANY, INC.	)	Docket No.
	)	
for approval to commit funds in	)	
excess of $500,000 for Item Y48500,	)	
East Oahu Transmission Project.	)	
	)	

CERTIFICATE OF SERVICE

I hereby certify that I have this date served two copies of the foregoing Application, together with this Certificate of Service, by making personal service to the following and at the following address:

Division of Consumer Advocacy
Department of Commerce and Consumer Affairs
335 Merchant Street, Room 326
Honolulu, Hawaii 96813

DATED: Honolulu, Hawaii December 18, 2003

HAWAIIAN ELECTRIC COMPANY, INC.

George S. Hirose

George S. Hirose